JPRS-WST-84-009

21 March 1984

West Europe Report

SCIENCE AND TECHNOLOGY

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WEST EUROPE REPORT

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AEROSPACE

DETAILS ON SPOT REMOTE SENSING SATELLITE PROPULSION UNIT

Paris L'AERONAUTIQUE ET L'ASTRONAUTIQUE in French No 103, 1983 #6, pp 32-40

[Article by J. C. Corai of the SEP, Space Department, Vernon: "The Propulsion Module of the SPOT Platform"]

[Text] [Summary in source-provided English] The SPOT platform includes a propulsion module equipped with a hydrazine reaction control system (RCD). This RCS belongs to the attitude and orbit control system.

It comprises essentially 2 branches of catalytic thrusters fed by surface tension tanks through a circuit providing their interconnection by latching insulation valves. It operates in blow-down mode. Each equipment is qualified individually.

At RCS level, are assembled and tested a development model (half-system) then, according to the "protoflight" philosophy followed for the development of the platform, a qualification/flight model.

Introduction

SEP [European Propellant Company] is developing the propulsion unit of the SPOT [Earth Observation Probe System] platform. This platform is designed for adaptation, through minor modifications, to various satellites carrying payloads for closely related missions (Fig 1 [not reproduced]). These satellites will have heliosynchronous and circular orbits at altitudes ranging between 570 and 1,200 km and will be triaxially stabilized. Their weight will be of the order of 1,850-2,000 kg depending on missions; the quantity of fuel carried (hydrazine anhydride) will vary between 150 and 300 kg.

The platform includes a service module, a solar panel and a thruster module. The payload attaches to the platform on one face of the thruster module. The core of the satellite will measure about 2 m x 2 m x 3.5 m.

The SPOT program is being headed by the CNES [National Center for Space Studies]. MATRA [Mechanics, Aviation and Traction Company] and CNES will be the prime contractors for the platform and payload respectively.

Functions of the Propulsion Unit

The propulsion unit is part of the attitude and orbit control system. Its functions are to provide power and torque thrusts:

--During injection into orbit, for the acquisition of attitude and orbit; and

--During orbital life:

- For orbital control and changes, with simultaneous attitude control;
- In "routine" mode, for attitude control, but only in case of malfunction of the normally used actuators (reaction wheels desaturated by magnetic couplers);
- In "survival" mode, for attitude control, consisting then of pointing the yaw axis toward the Sun.

The propulsion unit delivers these power and torque thrusts in accordance with orders received from the propulsion and survival electronics systems. Acquisition of attitude commences at the separation, with a deceleration phase in the residual speeds of rotation about the three axes.

For orbital acquisition and control, the propulsion unit furnishes power thrusts in the orbital plane and perpendicular to it and simultaneously provides attitude control. Upon detecting an unreconfigurable malfunction, the satellite can instantaneously switch to the survival mode, in which case the propulsion unit is simultaneously activated to acquire and maintain a solar pointing.

Pressures within the circuit and engine temperatures are read constantly throughout the mission other than in survival mode. The useful life designed into the propulsion unit is 3 years in orbit after a ground-storage period of 2 years.

Description of Propulsion Unit

Principle and Main Components

Operation of the propulsion unit is based on decomposition of the hydrazine, used as a monopropellant. Two redundant branches of eight thrusters each are fed helium-pressurized hydrazine at blowdown pressures of 22 to 5.5 bars. Circuit functions and their respective equipment are as follows (see Fig 2):

--Storage and pressurization of the hydrazine in two or four tanks depending on the mission (two for SPOT), maximum capacity of usable hydrazine being respectively 150 and 300 kg;

--Interconnection and shutoff of tanks (or pairs of tanks) and of thruster branches, by means of four shutoff valves;

--Hydrazine filtration, with one filter per branch, upstream of the shutoff valves;

--Monitoring of pressures, with one pressure sensor per branch, downstream of the shutoff valves;

--Filling and emptying of hydrazine: One valve per tank (or pair of tanks);

--Pressurization and depressurization: One valve per tank.

Components Layout and Interfaces

The thruster array is mounted on a specifically-designed structure, the propulsion module structure, equipped for this purpose with a circular base (perpendicular to the axis of the launcher in launch configuration) and lateral flanges supported by secondary structures. The thrusters are located as shown in Fig 3, depending on the module involved, each module having one thruster per branch for each function it performs. Thus, there are:

--Two "pitch-yaw" modules located on the faces perpendicular to the orbital direction and each having:

- 2 x 2 thrusters, 15.6 N [Newtons] each (for orbital and yaw control);
- 2 x 1 thruster, 3.5 N each (for pitch control).

--Two "roll" modules located on the face oriented toward space during orbit:

- One having 2 x 1 thruster, 3.5 N each (for roll control);
- The other having 2 x 1 thruster, 15.6 N each (for roll control).

The fuel supply circuit equipment is distributed among the following modules (Fig 3):

--Two or four cylindro-hemispheric tanks attached to the circular base they intersect;

--One "fluids-interface" module located on the face oriented toward Earth during orbit and containing the fuel-fill valves (two) and the pressurization valves (two or four);

--One "distribution" module located underneath the circular base and containing:

- The four shutoff valves;
- The two filters;
- The two pressure sensors;

--Tubing modules interconnect the thruster and equipment modules.

Figs 4 and 5 show top views and bottom views of the propulsion unit in its SPOT version, the reference position being in launch configuration.

Hydraulic connections to equipment are mechanical except those of the helium circuit, which are welded.

The thruster modules and the distribution module have electrical connectors to which their electrical and electromechanical equipment are wired. These connectors are attached to the structure in the proximity of the modules. They make up the propulsion unit's electrical interfaces with the propulsion and survival electronics and, during integration, with the test bay.

Preparation and Execution of Maneuvers

The thrusters are equipped with "bedwarmers" for preheating their catalytic bed in preparation for a maneuver. All the bedwarmers of the same (and only one) branch are controlled together and are kept under voltage throughout the duration of the maneuver. Thus, one branch of thrusters is preheated:

--Before and during launch to prepare for acquisition of attitude and orbit;

--Before orbital control maneuvers carried out at preset times of the mission;

--Simultaneously with every switch of the satellite to survival mode and throughout the duration of this mode.

Orbital control maneuvers consist of actuating simultaneously the two 15.6-N thrusters of the same branch of a pitch-yaw module. Simultaneous attitude and yaw control is accomplished by "off-modulation switching," that is, by momentary shutoffs of one thruster or the other.

Heat Control

The thrusters and the tanks are attached conductively to the structure, whereas all other equipment and tubing are insulated from it. The heat control system keeps the temperature of the tubing and equipment, including the solenoid valves of the idle thrusters, at between 10 and 50°C, by means, in particular, of "bedwarmers." In each thruster module, thermal shunts link together, in pairs, each thruster with its opposite number in the other branch, and bonds them directly to the structure.

These shunts enable limitation of the temperature rise of the thrusters' solenoid valves during survival mode phases, during which all the thrusters of one branch are continuously preheated for periods that can be of very long duration.

Development

Industrial Organization

The thruster-module structure is being built by SNIAS [National Industrial Aerospace Company [AEROSPATIALE]], as is also the service module. SEP is providing the definition, design and building, integration and testing of the propulsion unit, the heat control hardware being built by it, however, being limited to the thruster thermal shunts and the insulating brackets.

SEP is also developing and building the thrusters, tanks and pressure sensors.

The other equipment is being developed and furnished by Industria (fuel-fill and pressurization valves), SNIAS (shutoff valves) and SOFRANCE [expansion unknown] (filters).

Development Philosophy

The "protoflight" philosophy has been adopted for the development of the platform.

Three propulsion-unit models are being built. One mechanical and thermal model is being built to participate in the qualification of the platform structure and its heat control system.

A development model, a half-system, is being assembled on a dummy structure, specifically to fine-tune the operating procedures of the propulsion unit and to verify its hydrazine-fueled behavior with and without operation of the thrusters. This model will not be subjected to mechanical and heat testing. Specially designed tests are planned to check the vibrational behavior of the more critical tubings and the effectiveness of the thruster heat shunts. A flight-qualification model is being built, which will be integrated on the thruster-module structure, acceptance-tested, then abandoned. Acceptance testing will include leakproofing, electrical and operational tests, but not mechanical or heat tests. The qualification of the propulsion unit as a whole will not become definitive until completion of the tests on the "protoflight" model of the platform with which it is incorporated.

Each piece of equipment will be formally qualified upon completion of a program based on the record of its development from its very start.

Equipment

Thrusters

The 3.5-N and 15.6-N thrusters are, except for a few minor modifications, identical to the thrusters developed and qualified for previous programs: D5A, METEOSAT (3.5 N), GEOS, METEOSAT, EXOSAT (15.6 N).

They consist (see Fig 6) of a solenoid valve (the same one for both types) and a motor equipped with a "bedwarmer," a thermocouple and a heat shield.

The principal characteristics of the solenoid valve are:

--Normally closed, axial flow;

--Dualed pliant seat in tandem, single winding;

--"All-welded" design;

--Integrated filter;

--Power consumption: 5.5 W at 23 V (nominal power supply voltage);

--Response time: 10 ms opening, 15 ms closing;

--Qualified for 1,000,000 cycles opening and closing.

The engines are provided with a charge of CNESRO [expansion unknown], which is used as a catalyzer and is produced under the prime contractorship of SEP.

Their "bedwarmer" develops 7 W at the nominal power supply voltage of 31 V, by means of which the engine temperature can be raised to 160°C, which is the required temperature for startups, in less than 1 hour.

The materials used are essentially stainless steel (solenoid valve) and Inconel (engine).

The weights of the 3.5-N and 15.6-N thrusters are, respectively, 390 grams and 480 grams.

Over the blowdown range of fuel-feed pressures (22 to 5.5 bars), their thrust decreases from 3.5 to 1 N, and from 15.6 to 4.8 N, respectively.

Both must operate in widely varying modes: Continuous, pulsed, duration of thrust down to 125 ms, and duration of shutoff up to several minutes, in limited cycles.

The qualification requirements are summarized as follows:

--Startups at preheated temperature (160°C): 2,700;

--Cold startups: 7;

--Activations at normal operating temperature: 35,000;

--Total thrust:

- 15.6 N: 200,000 Nsec,
- 3.5 N: 32,000 Nsec;

--Cumulative duration of operation in continuous mode:

- 15.6 N: 6 hrs,
- 3.5 N: 20 min.

Some 50 startups at preheated temperatures are those required for simultaneous orbital and attitude control. The rest, hence almost the total number, are available for solar pointing in the survival mode. The cold startups are required when going into survival mode, involving the startup of certain thrusters without preheating and at engine temperatures down to -10^{0}C.

A model of each thruster has been put through a qualification program, the principal results of which are as follows:

Item	15.6 N	3.5 N
--Startups at preheated temperature	2,700	2,717
--Cold startups	7	9
--Activations at normal operating temperature	39,696	43,191
--Cumulative duration of operation in continuous mode	6 hrs	63 min
--Longest continuous period of operation	35 min	30 min
--Quantity of decomposed hydrazine	95.5 kg	25 kg
--Total delivered thrust	208 kNsec	54 kNsec
--Thrust in continuous mode		
- Start of qualification: 22/5.5 bars	15.4/4.6 N	3.6/1.1 N
- End of qualification: 22/5.5 bars	13.4/4.1 N	3.1/1.0 N
--Specific thrust in continuous mode		
- Start of qualification: 22/5.5 bars	239/233 sec	229/215 sec
- End of qualification: 22/5.5 bars	233/227 sec	216/196 sec

Tank

The fuel tank, newly developed for the SPOT program, utilizes surface tension. Cylindro-hemispherical in shape (see Fig 7), it consists of an outer shell (diameter 0.4 m; height 1 m) containing a liquid expulsion device [DEL]. The shell is equipped with a harness by means of which the tank can be attached at three points, and with an orifice at each end: One for filling and emptying the hydrazine, the other for pressurization and depressurization using helium.

The tank stores the hydrazine and the helium that pressurizes the hydrazine at a value that decreases normally from 22 bars to 5.5 bars as the hydrazine is consumed (75 usable kg). Thus, the tank, which has a usable volume of 112 liters, is filled to only around 75 percent of its capacity at the start of a mission.

The DEL collects the hydrazine and, despite the absence of a material separation of phases, delivers the hydrazine free of its pressurizing gas. It consists of a collector and a gas trap. In launch configuration, the tank's longitudinal axis is vertical and the gas trap is at the bottom, fully immersed and filled with liquid.

The collector collects the liquid by capillary action close to the sall of the shell and siphons it to the gas trap. For this purpose, it has 24 main strainers interconnected among themselves by a network of tubes and thin webs, and empties at the base of the gas trap via four secondary strainers. The main and secondary strainers are equipped with wire-gauze membranes which, once wet, permit the passage of liquid but form a barrier to gas until a certain pressure differential between their two faces (bubble point) is reached. During launch (and sometimes the initial phase of attitude acquisition), accelerations are such that they inhibit the wetting of the upper main strainers. Some gas then penetrates into the collector and is imprisoned there as soon as these strainers are wetted at the start of attitude acquisition.

The gas trap prevents this imprisoned gas from being drawn out of the tank by the liquid. The trap consists of a cylindrical housing capped by two wire-gauze membranes (one at the bottom, the other on top) through which the liquid must pass on its way out of the tank. Near the top, an orifice equipped with a wire-gauze membrane, connected to the collector by a tube, enables purging of the trap during its filling with liquid. The gas trap is of sufficient size to store a quantity of gas equal to the total volume of the collector. It is isolated from the latter by the wire-gauze membranes of the purging orifice and of the secondary strainers located at its base. Thus, it cannot receive gas before the formation of the collector's gas barriers, and the quantity of gas finally imprisoned in the DEL cannot exceed the trap's storage capacity.

The DEL's function commences at the separation. From that instant on, it must collect the hydrazine by siphoning uninterruptedly regardless of changes in pressure owing to environmental accelerations and flow demands placed on it by the thrusters. The most exacting conditions occur in the orbital control mode where, under accelerations that can attain 3.6×10^{-3} g, a maximum of three 15.6-N and one 3.5-N thrusters must be fed simultaneously. The quantity of hydrazine remaining in the tank when the first gas bubble appears at the outlet is termed "uncollectible."

A series of tests has been set up to determine the state of a tank's strainers at every stage of a qualification or acceptance-test program. It consists essentially of draining the tank in different positions.

The principal characteristics of the tank are:

--Pressures:

- Maximum usable: 22 bars;
- Test: 33 bars;
- Rupture: 44 bars;

--Usable volume: 112 liters;

--Maximum permissible hydrazine volume: 78 liters (can be reduced to 40 liters).

--Principal dimensions:

- Diameter: 404 mm;
- Height: 1,108 mm.

--Materials:

- Outer shell: Titanium;
- DEL: Stainless steel.

--Weight: 14.2 [as published].

--Maximum uncollectible:

- In orbit: 0.65 liters of hydrazine, or 0.6 percent of usable volume;
- Ground levels: Depends on orientation of the tank as a function of acceleration of gravity; 2.6 liters maximum for a tank inclined at 45 degrees with one main strainer at the DEL's lowest point but gas trap at the top.

Development is being based on previous work done in connection with tank prototypes, spherical in shape and of lesser volumes, but closely related as to underlying principles. This work had made it possible essentially to validate the mode of operation and to develop the technology involved in attaching the wire-gauze membranes.

The developmental work done under the SPOT program has consisted of individual-component and assembled-unit tests, and of setting up manufacturing procedures.

The individual component tests have been designed to:

--Arrive at the best configuration of the strainers from the standpoint of optimizing their behavior under vibrations;

--Verify the long-term compatibility of the wire-gauze membranes and their attachment, with hydrazine, and their behavior under cyclings between vibration and demands for fuel.

Concurrently, assembled-unit tests were run at two levels: The DEL alone and the complete tank. One DEL was built to undergo, inside a heavy shell, operational tests and tests under vibrational conditions. The latter led to the definition of structural improvements. Then, a complete model of the tank was built and subjected to a prequalification run involving, in particular:

--Operational tests;

--Qualification-level vibrations;

--75 cycles of pressurization from 0 to 22 bars;

--Rupture test at specified rupture pressure (44 bars);

--Opening up and evaluation of results by experts.

Also concurrently, and in accordance with test results, fabrication procedures were refined, principally those concerning TIG [tungsten-inert gas] welding of the DEL tubes to:

--Avoid internal oxidation (for compatibility with hydrazine);

--Optimize their resistance to fatigue under vibration.

The prequalification model enabled:

--Validation of the operating principle involved;

--Qualification of the shell;

--Validation, in essence, of the DEL's resistance to vibrational stresses.

The two failures that occurred (rupture of one main strainer and a crack in one tube) were resolved in the individual-components tests of the strainers that were carried out concurrently, and in the refining of welding procedures.

The official qualification model is in the course of being built.

Auxiliary Equipment

Fill and Pressurization Valve

This is a manually activated, self-closable valve. The same type is used for the hydrazine and the helium.

The valve body is made of titanium. Leak-tightness is provided by an EPR [ethylene-propylene rubber] seal, with redundancy being provided by a casing equipped with a metallic seal. Its weight is 115 grams. Its development was based on existing aeronautical equipment.

Shutoff Valve

This is a bistable, magnetic-locking solenoid valve, equipped with a state detector (mini-breaker). It must be good for 1,000 maneuvers.

When in the closed state, it must act as a relief valve at 45 bars over the downstream pressure, so as to limit the overpressures that may occur in a branch of thrusters in the event two of the shutoff valves feeding it are simultaneously in the closed state.

The valve body is made of steel. Leak-tightness is provided by a PTFE [polytetrafluoroethylene] check valve. Its weight is 370 grams. The valve was newly developed for this program, the locking principle, however, having been previously developed.

Filter

The body and the filter element are made of stainless steel. The absolute filtration factor of the membrane is 10 microns. Weight of the filter is 76 grams. The filter has been developed from existing equipment.

Pressure Sensor

This sensor is of the "absolute" strain-gage type, without integrated amplifier. Its principal characteristics are:

--Measurement range: 0-30 bars;

--Sensitivity: 2 mV/V;

--Initial zero error: 0.1 percent of full scale;

--Cumulative measurement error: 1 percent of full scale;

--Body made of titanium;

--Weight: 60 grams.

Its development is essentially new.

Tubing

Tubing is made of titanium; diameters are 6.35 mm x 4.95 mm. Tubing modules are assembled by means of TIG welding.

Ground Facilities

Ground facilities for the propulsion unit include essentially:

--A control and electrical measurements bay for the integration and testing operations;

--Fueling equipment, consisting of two servicers: One for pressurization to operational or test levels (remote-controllable); the other a "multifunction" one for liquids (simulation, cleaning, hydrazine) and low-level pressurization;

--Leak-tightness measuring equipment, consisting essentially of a mass spectrometer. This measurement consists of placing the thruster module, helium-pressurized at 10 bars, in its container, and measuring the changes in concentration of this gas in the atmosphere of the container.

[Equipment Weights]

Equipment	Weight
Tanks (14.20 kg x 2/4):	28.4/56.8 kg
Fluids-interface module:	1.46/1.73 kg
Distribution module:	2.26 kg
Pitch/yaw module (4.60 x 2):	9.20 kg
Roll module (plus):	1.12 kg
Roll module (minus):	1.34 kg
Tubing (with supports):	1.87/2.35 kg
Total dry weight:	45.65/74.8 kg
Maximum weight of hydrazine (78.6 kg x 2/4):	157.2/314.4 kg
Helium (0.11 kg x 2/4):	0.22/0.44 kg
Total weight at start of operational life:	203.17/389.8 kg

[Diagrams follow]:

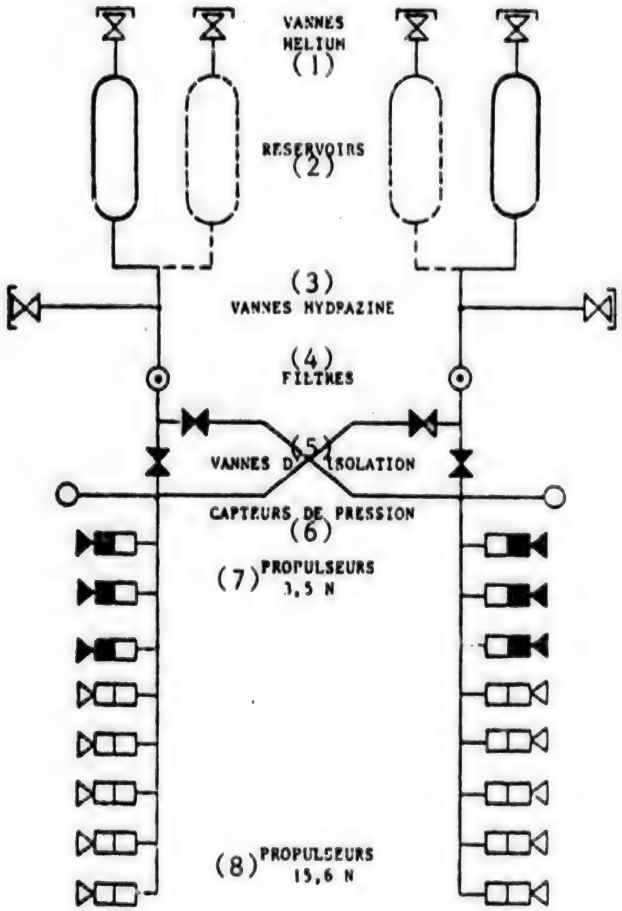


Fig 2 - Functional diagram.

Key:

1. Helium valves.
2. Tanks.
3. Hydrazine valves.
4. Filters.
5. Shutoff valves.
6. Pressure sensors.
7. 3.5-N Thrusters.
9. 15.6-N Thrusters.

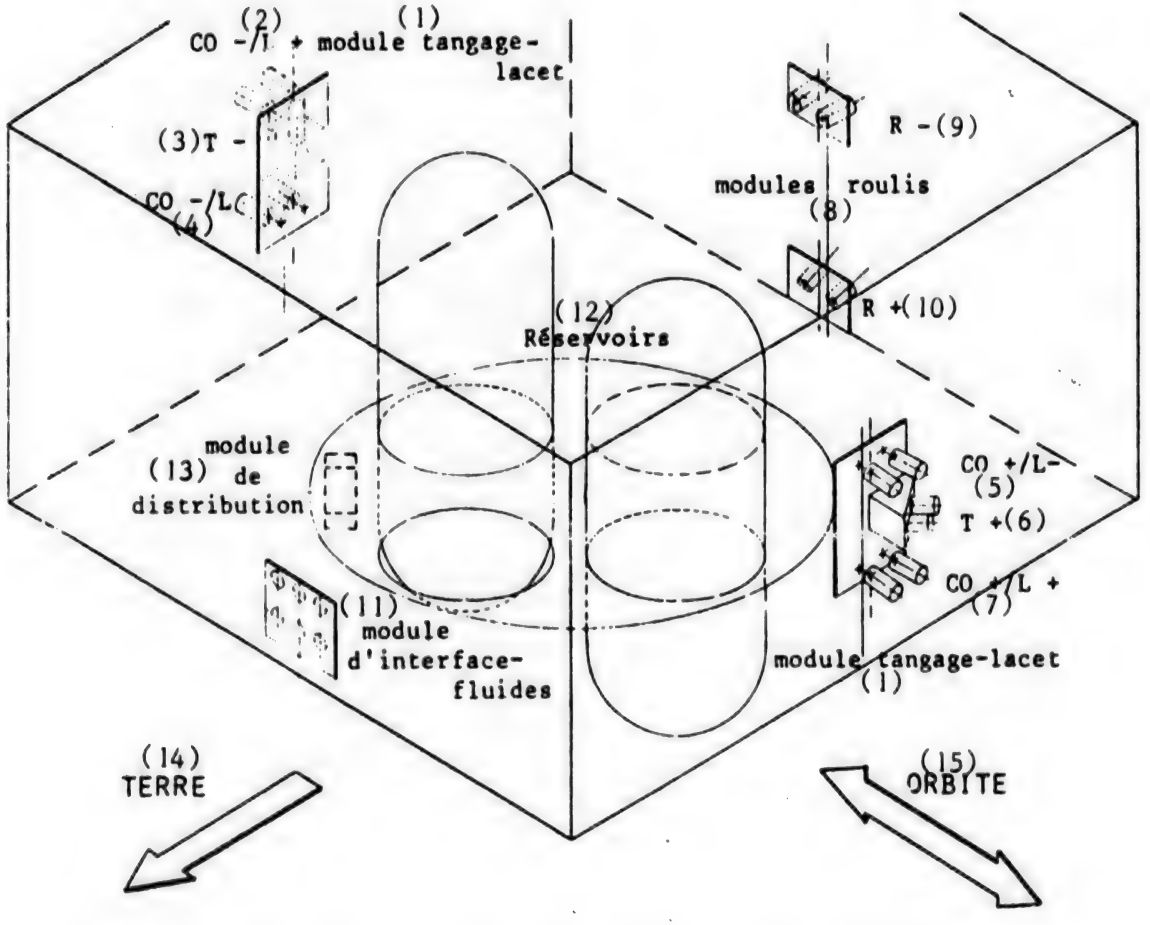


Fig 3 - General layout of thruster array in the propulsion module.

Key:

1. Pitch/yaw module.
2. Orbital control (minus)/yaw (plus).
3. Pitch (minus).
4. Orbital control (minus)/yaw (minus).
5. Orbital control (plus)/yaw (minus).
6. Pitch (plus).
7. Orbital control (plus)/yaw (plus).
8. Roll modules.
9. Roll (minus).
10. Roll (plus).
11. Fluids-interface module.
12. Tanks.
13. Distribution module.
14. Earth.
15. Orbit.

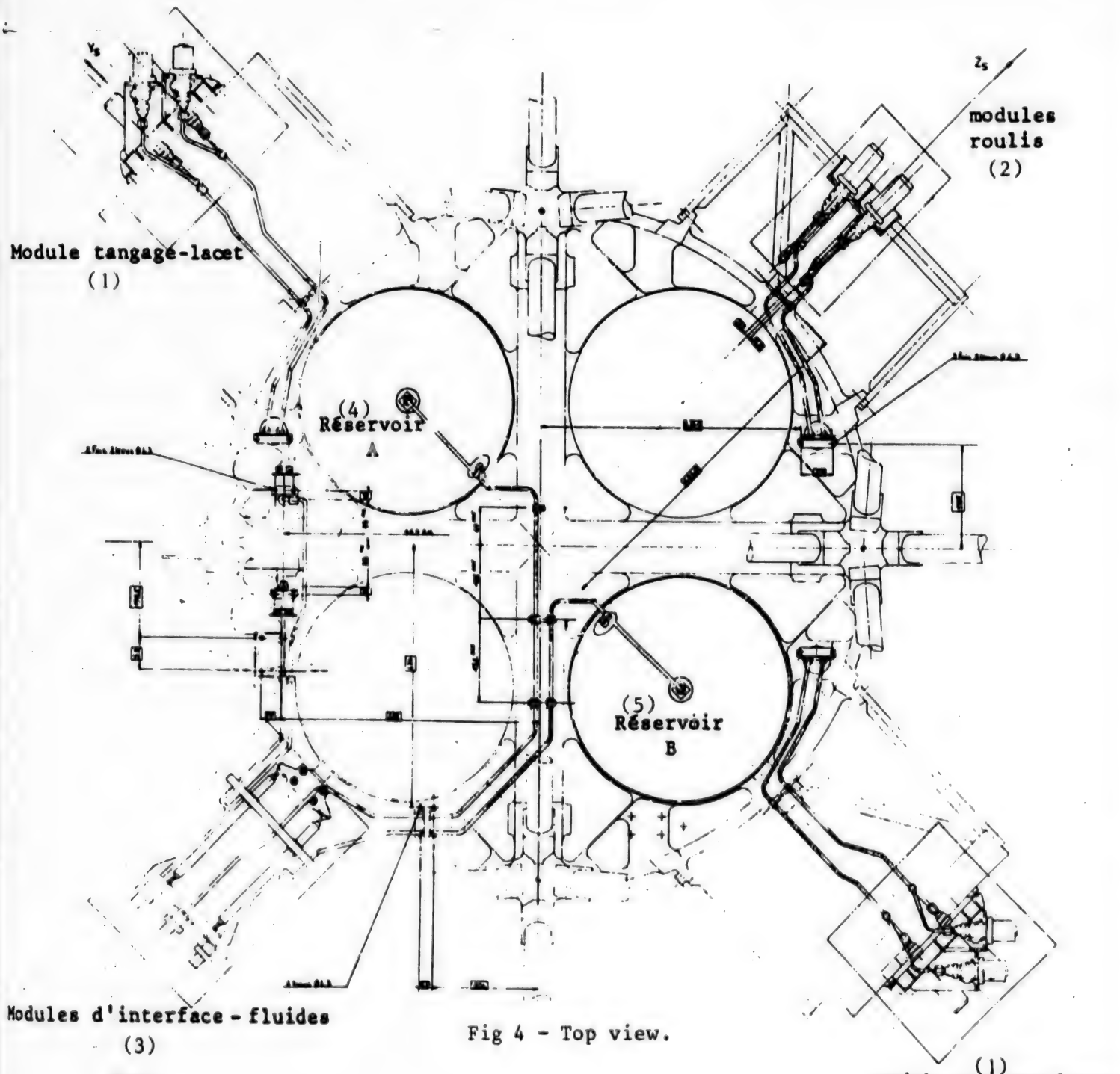


Fig 4 - Top view.

Key:

1. Pitch/yaw module.
2. Roll modules.
3. Fluids-interface modules.
4. Tank A.
5. Tank B.

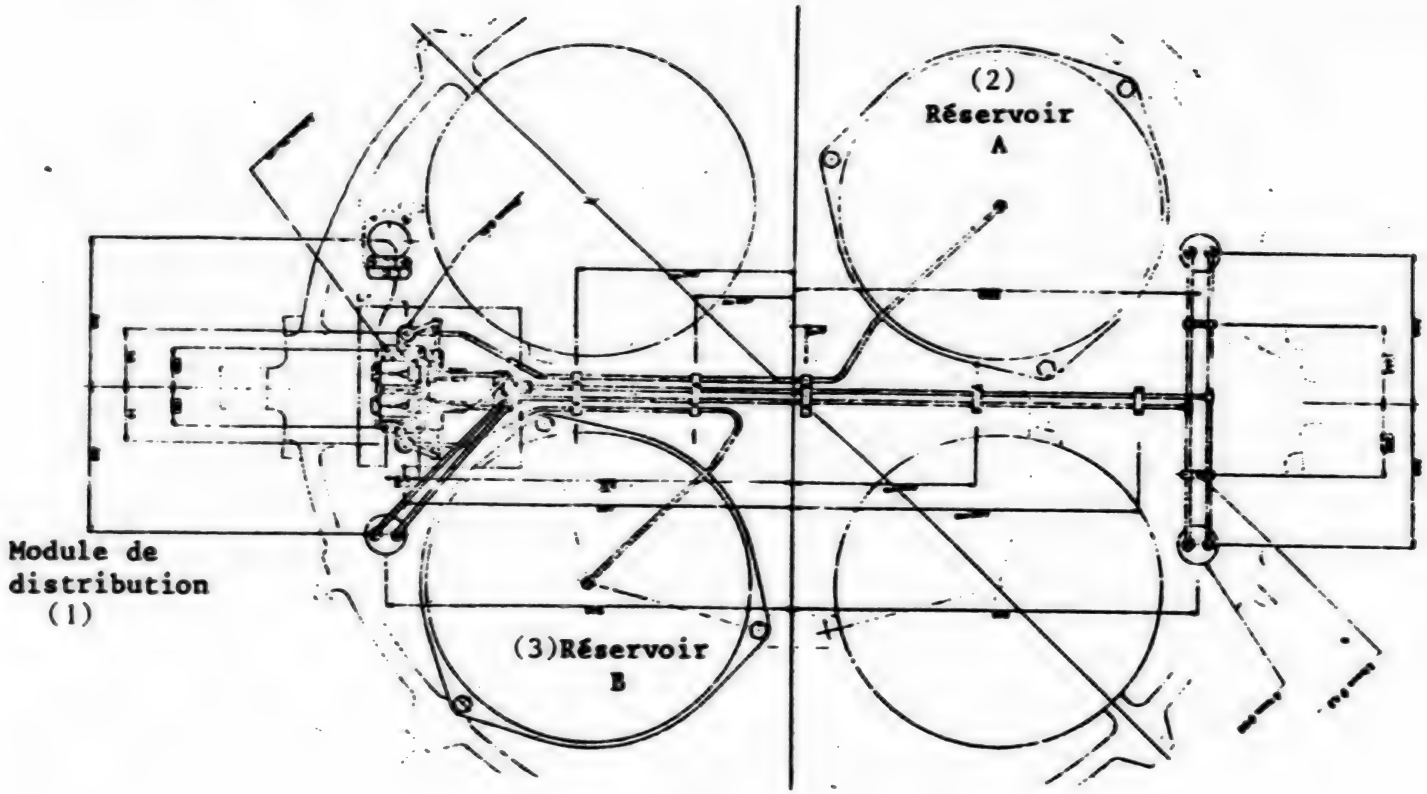


Fig 5 - Bottom view.

Key:

1. Distribution module.
2. Tank A.
3. Tank B.

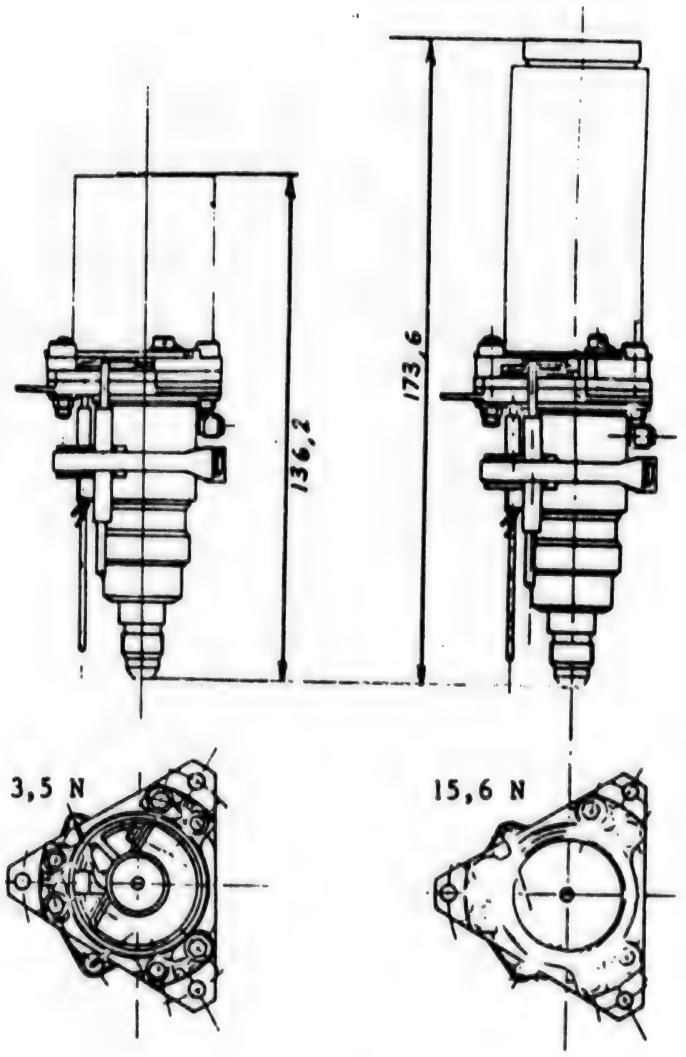
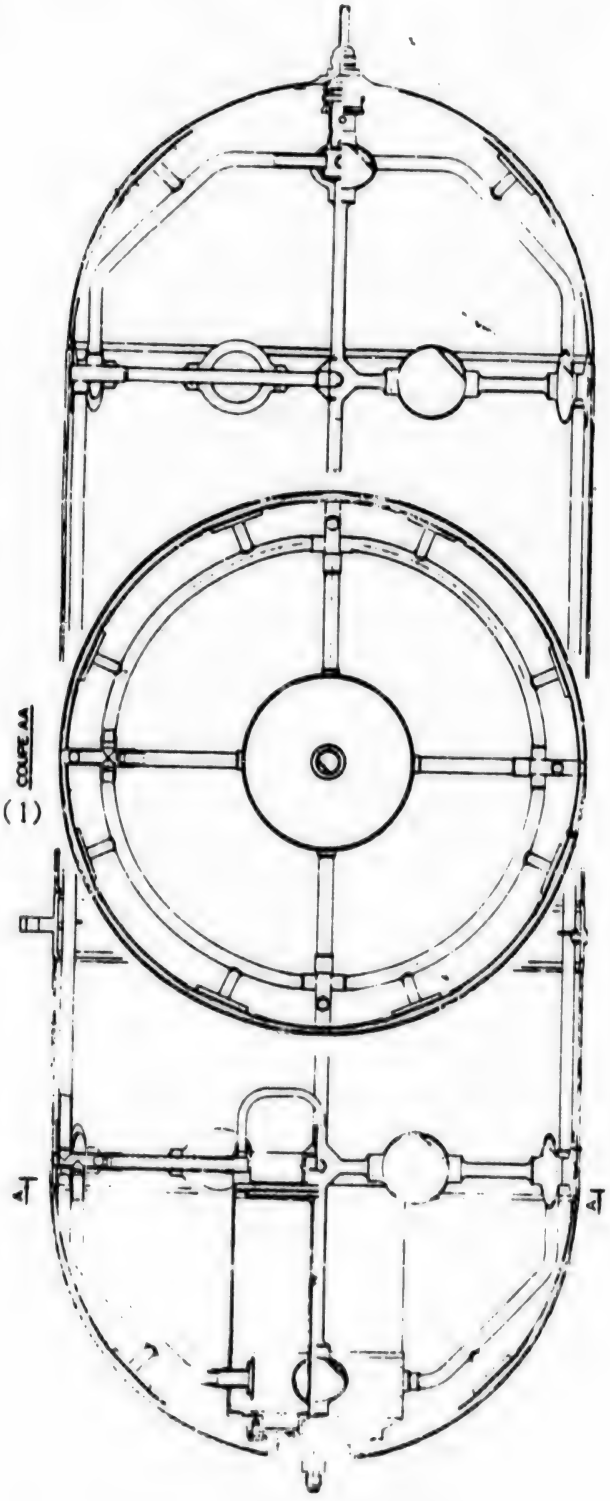


Fig 6 - Thrusters.



Key:

1. Section AA.

Fig 7 - Tank.

9399
CSO: 3698/266

AUTOMOBILE INDUSTRY

NISSAN TO BUILD PILOT AUTOMOBILE PLANT IN UK

Paris AFP-AUTO in French 2 Feb 84 AFP 011723, 011845, 011847, 020854 Feb 84

[Unsigned article]

[Text] Great Britain: Details of Agreement With Nissan Given to Commons

London, 1 February (AFP)--On Wednesday, the British minister of trade and industry, Norman Tebbit, announced to the Commons that the Japanese automobile manufacturer Nissan will install a pilot plant in Great Britain, to produce 24,000 cars per year beginning in 1986, and create 400 to 500 jobs.

The minister went on to say that as a second stage, the plant can be expanded to support about 2700 employees, and the British government is ready to back Nissan with 35 million pounds (50 million dollars), in addition to regional aid, in order to encourage the company to carry out this expansion.

The agreement was immediately denounced by the Labor opposition, whose spokesman for industrial matters, former minister Peter Shore, declared that it would create no net employment increase, nor any net improvement in the balance of payments, since most of the parts for car construction have to be imported from Japan.

Nissan Implantation in Great Britain

London 1 February (AFP)--Nissan, the Japanese automobile giant whose cars are also sold under the name of Datsun, will begin to build its cars in Great Britain, but very carefully.

Under the terms of an agreement signed Wednesday in London by its chairman, Takashi Ishira, and the British minister of trade and industry, Norman Tebbit, the company will open at a still undetermined location, a pilot plant which will assemble 24,000 cars per year, entirely imported as parts from Japan, beginning in 1986. This plant, which will employ 400-500 people, will require an investment of 50 million pounds (70 million dollars), to which the state will contribute 15 or 22 percent depending on the region in which the plant will be located. The cars will be considered as Japanese, meaning that they will be subtracted from the annual quota limiting the importation of Japanese cars into Great Britain to 11 percent of the market, and will not be re-exportable to other common market countries as being of British origin.

If this first operation proves to be satisfactory, Nissan plans to expand the plant with a global investment of 300 million pounds (420 million dollars). This investment will make it possible to produce with about 2700 workers, 100,000 cars per year, whose British share would initially be 60 percent of their value upon leaving the plant in 1990, and 80 percent when the plant would reach its maximum production the following year. According to common market regulations, the cars would then be considered as "made in Britain." Not only would they circumvent importation quotas, but they could then also be exported duty-free to the other common market countries.

The British government would also subsidize 15 to 22 percent of the investment, and what is more, to encourage Nissan to build, Mr Tebbit indicated to Parliament that he had promised Nissan a "special inducement" of 35 million pounds (about 50 million dollars). Altogether, the expanded project would cost the British taxpayers 80-101 million pounds (112-140 million dollars).

Ultimately, even in its expanded version, the project is much less ambitious than the one outlined three years ago at the start of the negotiations. At that time, the plant was to have a capability of 200,000 cars.

Nissan is presently already selling a little more than 100,000 cars per year on the British market.

However, the Thatcher government expects that with spinoffs to local manufacturers of components and other supplies, about 6000 new jobs would ultimately be created. Moreover, it expects that this Japanese influence would have a beneficial competitive influence on the local components industry, as well as on the rest of the automotive industry.

Nissan's prudent decision to start with a pilot plant is due both to a compromise reached with the Japanese unions which opposed the project for a long time, fearing job losses at home, and to the desire to become acclimated before becoming more deply involved. In particular, the Japanese builder wants an on-the-spot test of its relations with the British unions, which have acquired a hard reputation abroad, as well as of its dealings with local parts manufacturers.

Mr Kawamata Mentions Second Phase of Nissan's Implantation in Great Britain

Tokyo, 2 February (AFP)--Nissan will make every effort to achieve the second phase of its implantation in Great Britain, Katsuji Kawamata, board of directors chairman of the second largest Japanese automobile company, declared on Thursday to the press.

"The agreement of principle signed on Wednesday with the British government, is aimed at an eventual annual production of 100,000 cars, but if everything goes well, the company will not hesitate to raise its production volume to 200,000 units" stated Mr Kawamata.

In turn, Ichiro Shioji, chairman of the Federation of Automobile Industry Unions, indicated in a press conference that the union and the management should enter into preliminary negotiations before Nissan undertakes the second phase of the project. Last summer, Mr Shoji stated that he was against a Nissan implantation in Great Britain, pointing out that it could threaten jobs in Japan, and that the union had not been sufficiently consulted by the management.

11,023
CSO: 3698/281

AUTOMOBILE INDUSTRY

FRG'S DAIMLER-BENZ BUYS MAJORITY IN SOUTH AFRICAN AUTO FIRM

Duesseldorf VDI NACHRICHTEN in German 3 Feb 84 p 6

[Text] With the consent of its other two partners, Daimler-Benz AG of Stuttgart will assume a majority holding in the South-African vehicle-manufacturing outfit UCDD (Pty.) Limited in Pretoria, by way of a two-stage increase in capital stock of 30 million rand (about DM 67.2 million). According to information from a spokesman of the firm, an initial increase from 1.5 million to 15 million rand was effected already in December 1983. The second step to 31.5 million rand is to executed by the middle of 1984. With that, Daimler-Benz AG is systematically continuing its policy on affiliates, which has the objective of allowing it to be able to have direct control over its foreign marketing and subsidiary companies.

In a press release, it is said in addition that of the UCDD's total capital of 1.5 million rand, at present 39.9 percent is held by Volkskas, South Africa, 36.7 percent by Daimler-Benz AG, and 23.4 percent by the Swiss Ernst-Goehner Foundation. After the capital increase, Daimler-Benz AG will have increased its share in the UCDD to 50.1 percent. The two other partners will then still hold 26.5 percent and 23.4 percent of the shares.

The UCDD manufactures and markets Mercedes-Benz automobiles and commercial vehicles, and since October 1982 also Honda cars under license. It is one of the largest firms in the South-African automobile industry and one of the largest private companies in the country. In 1966 Daimler-Benz AG bought an interest of 26.7 percent in this firm, which was founded in 1962. At the end of 1982 the 10-percent share held by the South-African Rentmeester Group was taken over, which led to the now-accumulated holding of 36.7 percent.

The release says that by the decision which they have made, the UCDD partners want to allow for the growing importance of this company within the Daimler-Benz group of companies. The volume of its automobile production has doubled since 1981, and the facilities for the manufacturing of commercial vehicles and engine units have expanded substantially. It is said that with this the UCDD should be able to eliminate the delivery bottlenecks which have occurred again and again in the last 3 years.

In 1983, in the South-African market about 8 percent fewer Mercedes-Benz cars were sold, numbering 13,600 units (against 14,816), and 27 percent fewer commercial vehicles were sold, numbering 4,200 units (against 5,787).

12114
CSO: 3698/273

TURIN GROUP SURVEYS ITALIAN AUTO R&D EXPENDITURES 1979-80

Turin ATA INGEGNERIA AUTOMOTORISTICA in Italian Oct 83 pp 653-655

[Article by Ruggero Cominotti, on the survey conducted by the Parti Group of the National Automobile Industry Association (ANFIA)]

[Text] A survey done by the R&P (Research and Planning) of Torino, on behalf of ANFIA's 'Gruppo Parti' for Automobiles, covered activities in research, development, experimentation, and planning engaged in by the companies involved in the production of automobile and industrial vehicle components.

The information provided by the companies was standardized so as to allow for some overall assessments which reveal the financial commitment made by Italian components manufacturers and exchanges with foreign countries involving technology acquisitions and transfers.

The survey focused on the economic aspects of the research, development, and planning activities of components companies in Italy. It also focused on public financing for applied research through contributions to a revolving fund and low-interest financing provided by the Italian Credit Institute's Research Fund.

The survey covered 108 companies with a combined payroll of 79,500, 63,400 of whom are engaged solely in the production of components for street and highway motor vehicles.

Billing by these 108 firms in the area of automotive components in 1980 came to 2.930 billion lire, and accounted for 75.3 percent of the sector's total turnover.

This survey, viewed as adequately representative of the overall picture, showed that the components companies surveyed (probably among those most committed to research and development) averaged a 3.2 percent share of their total billing as a set-aside for spending

on research, development, experimentation and testing, pre-production, and planning.

Consistent with this commitment, the technology budget (acquisition and transfers of licences, patents, and know-how from abroad) for the sector, which is extremely heterogeneous insofar as technology and products are concerned, was well in the black for the entire 1979-1981 period at 10.1 billion lire. Hence this indicator, too, attests to the fact that the sector produces and uses advanced technologies.

Research and Development, Experimentation, and Pre-Production Testing

All told, expenditures by the component-producing companies on research and development, experimentation, and pre-production testing (expenditures given in full detail by 85 of the 105 respondents to the questionnaire) came to 40 billion lire during 1980 (see Table 1).

Expenditures on research and development, experimentation and pre-production testing by these same companies averaged 1.56 percent of total turnover.

In 11 of the firms, such expenditures came to 6.5 percent of billing; in 20 others, it averaged 3.3 percent.

Planning Activities

As for planning, expenditures were reported in exhaustive detail by 87 companies, whose combined billing came to 83.8 percent of that of firms responding to the questionnaire; this expenditure in 1980 amounted to 37.9 of gross earnings (GL). It accounted for 1.63 percent of total combined billing.(see Table 2).

In the context of this overall assessment, we find that ten firms set aside 6.1 percent of their total billing for planning in 1980.

Another 14 firms earmarked an average 3.2 percent of their total billings for planning, while 20 reported similar set-asides for research and development.

Looking at this strong commitment on the part of many firms in the area of applied research and planning, we see that about 30 firms offered no data on these cost factors, probably because they view them as fairly marginal; be that as it may, these were small companies, in which the difficulty of singling out such costs might be very considerable.

What all this indicates is that there are a lot of firms seriously involved in applied research and planning here and, in terms of

TABLE 1 -- COSTS FOR R&D, EXPERIMENTATION, AND PRE-PRODUCTION TESTING IN 1980

(1)	(2)	(3)	(4)	(5)
< 1	11	4.368,7	934.861	0,467
1,1 ÷ 2	43	19.200,9	1.215.271	1,579
2,1 ÷ 4	20	11.218,3	342.006	3,280
> 4,1	11	5.237,0	80.268	6,524
In complesso (6)	85	40.024,782	2.572.406	1,556
Mancate risposte e risposte non quantificabili (7)	31	–	–	–

KEY:

(1) Percentage of total billing

(2) Number of firms responding

(3) A: R&D, Experimentation and planning costs (millions of lire)

(4) B: Total billing (millions of lire)

(5) $\frac{A}{B} \cdot 100$

(6) Overall

(7) No reply or unquantifiable replies

TABLE 2 -- 1980 PLANNING COSTS

(1)	(2)	(3)	(4)	(5)
< 0,1	7	65,55	65.553	0,1
0,2 + 0,99	13	7.163,8	803.265	0,891
1 + 2	43	15.239,7	1.067.153	1,428
2,01 + 4	14	9.681,9	298.152	3,247
> 4	10	5.754	94.023	6,104
In complesso (6)	87	37.904	2.328.126	1,628
Mancate risposte e risposte non quantificabili (7)	29	–	–	–

KEY:

(1) % total billing

(2) N° of firms

(3) Planning costs in millions of lire (A)

(4) Total billing in millions of lire (B)

(5) $\frac{A}{B} \cdot 100$

(6) Overall

(7) No response or unquantifiable response

TABLE 3 -- LOAN APPLICATIONS TO IMI-RESEARCH FUND, 1979 thru 1981

(1)	(2)	(3)	(4)	(5)
< 250	1	–	2	2
251 + 500	–	–	–	2
501 + 1.000	–	–	1	2
1.001 + 1.500	–	–	4	1
1.501 + 2.500	–	–	10	4
2.501 + 5.000	–	–	12	5
5.001 + 7.500	–	1	10	3
7.501 + 10.000	1	–	4	3
10.001 + 15.000	–	–	9	4
15.001 + 25.000	1	1	10	-
25.001 + 50.000	–	–	7	1
> 50.000	4	2	7	2
In complesso (6)	7	4	76	29

KEY:

(1) Billing brackets (in (millions of lire

(2) N° of applications pending or rejected

(3) N° of companies using the IMI Fund

(4) Number of companies stating they had never applied for financing

(5) Companies not responding to the questionnaire

(6) Overall

annual billing, that they constitute a remarkably high proportion of the sector.

In these companies, activities involving research and development, experimentation, pre-production testing, and planning account for a total of 3.18 percent of their total billing for 1980. These findings confirm the belief that Italian automotive components manufacturers are heavily committed; and yet every move made in industrial and corporate policy to enhance corporate commitment in this sector is aimed at companies which not only have already acquired a remarkable flair for innovation, but which must maintain it and heighten it to insure a rising level of efficiency and competitiveness on the part of individual companies and on that of the components sector as a whole.

Utilization of the IMI-Research Fund

By comparison with these levels of spending on research and development, assistance obtained through low-interest financing and from the IMI-Research Fund is anything but common: only four firms reported getting such financing, which in 1979 through 1981 was used to pay for R&D projects totalling 19.071 GL (see Table 3).

This contribution to financing R&D is certainly inadequate, because it is used by only a very small number of companies; it is not, however, to be sneezed at, when we recall the expenditures in 1980 alone for combined R&D, experimentation, and pre-production testing came to 40 GL.

In most industrial countries the automotive components sector, like all the other "locomotive" sectors of the industrial sector, get financing for research and development markedly superior to that thus far available to Italian firms.

When it comes to international competitiveness, this factor most assuredly plays a major role.

The four companies that did obtain financing together employ some 10,700 people, and together they reported 430.8 CL for 1980 (as compared, respectively, with 16.6 percent and 15 percent of the total number of companies responding to the questionnaire).

It is also worth noting that only seven other firms, in addition to the four already cited, have applied for financing to the IMI-Research Fund (and their applications are either still pending or have been rejected).

Among those turned down is one very small company; the other six rank among the big ones, by comparison with the average size of components manufacturers.

TABLE 4 -- ACQUISITIONS AND TRANSFERS OF PATENTS, LICENCES, AND KNOW-HOW FROM 1979 THROUGH 1981
(in millions of lire)

	Patents & Licences		Know-how		Total	
Acquisitions:	4,331		105		4,436	
From Italy	1,530		--		1,530	
EEC to Italy	2.247	2,801	105		2,247	2,906
From other countries	554				659	
Transfers	6,349		8,201		14,550	
To Italy	10		380		390	
To EEC-Italy	6,274	6,339	128	7,821	6,402	14,160
to other countries	65		7,693		7,758	
Balance Italy/Foreign Countries		+2,018		+8,096		10,114

This group of seven firms that are seeking or have applied for financing from the IMI R&D Fund is made up of fairly good-sized companies.

In 1980, they produced almost 500 billion lire worth of components, equal to 17.4 percent of the total billion of the companies responding to the questionnaire; they employ 6,700 people (10.70 percent of the sector total). Lastly, 76 firms replied that they had never applied for financing by the IMI-Research Fund; 29 companies did not answer this question, probably because they had never been fully informed as to the existence or the purpose of the IMI-Research Fund.

The Technology Ingredient in the Components Field

The balance between acquisitions and transfers of licences, patents, and know-how to and from foreign countries is largely favorable, in view of the dimensions of the exchange.

Involved are 22 companies, whose overall 1980 billing came to 1.502 trillion lire, or 54 percent of the total billing of firms responding to the questionnaire.

This would clearly indicate that the Italian components-manufacturers' contribution to international technological exchanges was quite large (see Table 4).

However, the reasons why these 22 companies are so avidly interested in technology exchanges are disparate indeed.

Only one company, part of a foreign-owned multinational, and two others with ties to Italian automobile makers, account for 88 percent of transfers to foreign countries.

Acquisitions abroad are far more disparate, and they involve, to varying degrees, 20 of the 22 firms in question.

Almost two thirds of the credit-side balance of 11.254 trillion lire over the 3-year 1979-1981 period comes from know-how exchanges, while only a third stems from transfers of licences and patents.

As for know-how exchanges, there is actually very little transfer aside from that directed abroad. When it comes to exchanges of licences and patents, however, 3.538 trillion lire credit balance comes from acquisitions totaling 2.801 trillion lire and transfers worth 6.339 trillion lire.

Technology exchanges between Italian companies consist primarily of transfers/acquisitions of patents and licences.

6182

CSO: 3698/288

BRIEFS

VW R&D EXPENDITURES--Wolfsburg, 6 February (AFP)--The FRG car manufacturer Volkswagen, devoted 1.4 billion DM (about 500 million dollars) for research and development in 1983, namely 3.5 percent more than in 1982, announced Ernst Fiala, of the group's board of directors, at the opening of the new VW research center in Wolfsburg. Of this, 140 million DM were spent solely on research, a sector which employs 650 people, 200 of them engineers, in Wolfsburg. In all, more than 10,000 employees of the Volkswagen group work in research and development. The new Wolfsburg center cost 73 million DM. [Text] [Paris AFP-AUTO in French 6 Feb 84 AFP 061148 Feb 84] 11,023

CSO: 3698/281

PESSIMISTIC FRG AIRBUS MARKET SURVEY WITHHELD FROM BONN

Duesseldorf WIRTSCHAFTSWOCHE in German 20 Feb 84 p 30

[Article: "Airbus: The Need Overestimated"]

[Text] The marketing chances for the new A 320 Airbus are not as favorable as originally predicted. The Bonn ministries feel that they have been deceived because a new market study was withheld from them for months.

The Bonn offices were innundated with a wave of indignation. In internal discussions the officials in charge from the ministries of economics and finance even voiced complaints of "fraud with subsidies."

The reason for the excitement are the new market prognoses of the German aviation industry for the proposed Airbus A 320 commercial jet, by means of which the European Airbus industry plans to expand its fleet and penetrate the market of smaller-size commercial jets. In the Bonn ministry offices, which are presentlypreparing the financing of the costly development and production of the new aircraft type, the study of the industry had "the effect of a bomb," according to a member of the staff of Otto Graf Lambsdorff, economics minister.

According to the new market estimates, the sales figures which have been assumed so far in all calculations--a total of approximately 600 aircraft throughout the term of the program from the start of the deliveries in 1988 to the year 2002--cannot be achieved. A Bonn official describes the result literally: "This makes the entire profitability of the A320 doubtful."

According to the new study during which the marketing experts of the Deutsche Airbus GmbH and Messerschmitt-Boelkow-Blohm (MBB) examined the prospective requirements of 230 air lines, the worldwide requirements with respect to commercial jets seating between 110 and 180 are estimated to be 2,500 aircraft up to the year 2002. This calculation only takes the requirements of the so-called free market into account that is not already occupied by successor models of already existing aircraft.

Of the estimated requirements, however, almost three-fourths account for passenger jets seating 110 to 145. Only a little more than one-fourth--640 aircraft--are required in the size seating between 150 and 180, the new Europe

jet being one of those. Airbus, however, would have to share this market share of 640 aircraft with Boeing, the U.S. manufacturer. Airbus' hope to obtain market shares in the smaller class of aircraft seating up to 145, thus being able to sell a total of 565 A 320's, is considered unfounded by experts in Bonn because the A 320 is to be equipped with 150 to 164 seats, depending on the spacing between the rows.

The expert officials have established a counter calculation. Of the required 2,500 aircraft, approximately 50 percent account for the U.S. market, which Airbus can hardly penetrate. Assuming that Boeing should be able to conquer half of the U.S. residual market, a balance of 625 remains--those, however, in the aircraft types seating between 110 and 180; Airbus cannot satisfy all of these requirements.

Now the Bonn officials do not know "how to get the bird to fly financially," says a ministry official. In the meantime, the Deutsche Airbus GmbH is having a computer calculate how the programs would look if 300, 400, or 500 aircraft were sold.

The Bonn officials had already anticipated subsidizing the A 320 with enormous amounts:

--The entire fund requirements for the serial production is 1.2 billion marks, a major portion of which was to be secured by government guarantees. The budgetary law, however, forbids the granting of guarantees, if at the time of granting it is foresseable that the liability of the guarantee will, in fact, be incurred.

--1.5 billion marks were calculated as federal marketing subsidies. Independent of the sales potential, which is now considered less favorable, the Airbus calculation contained risks from the very beginning. The Airbus industry, for instance, calculated a sales price of $24 million per A320. After four years, a price increase of eight percent was anticipated; nobody knows, however, whether this will still be feasible on the highly competitive market.

The Bonn officials were particularly incensed about the fact that the aviation officials had concealed the market study--dated 9 September 1983--for months. It was only by coincidence that the ministry officials, while working on a completely different subsidy application, happened to come across this study, whose existence is flatly denied by MBB: "No such study exists," declared an MBB spokesman when asked by Wirtschaftswoche. It was only on 8 November of last year that the Bonn cabinet unsuspectingly discussed the chances and financial commitment to the A 320 without knowing the new market prognoses. So far the Federal Government has committed only a relatively modest amount of 12 million marks for the preparatory development work.

In view of the already existing doubts regarding the economy of the new Airbus project, the Bonn cabinet had declared thus far that it would only approve the subsidies if the Airbus industry gained at least one other important air line customer for the A 320, in addition to the two state-owned French air lines. That might be the case now--British Airways might order 16 to 18 aircraft of the new type. The question now is whether or not Bonn will be satisfied with that.

9544
CSO: 3698/255

COMPUTERS

TANDBERG DATA OF NORWAY LOWERS PRICES TO COMPETE IN U.S.

Oslo AFTENPOSTEN in Norwegian 2 Feb 84 p 33

[Article by Brit Myhrvold: "Tandberg Data Lowers Prices in USA"]

[Text] New York, 1 February. "Tandberg Data will lower prices on its terminals in the USA by 25 percent as of 1 March. The experience has been that this Norwegian product is becoming too expensive on the American market. The competitors to a large extent produce in low-cost countries. Even IBM manufactures in the Far East," Director Odd Heldre says, who is the leader of Tandberg Data's American subsidiary company.

Tandberg Data has been established in the USA for two years and sold 300 units in 1983. Heldre figures that the amount will increase to about 900 in 1984, but it is obvious that sales in the USA did not develop so quickly as was believed when the American subsidiary company was established.

"The first thing they did was to test our product; their interest appeared to be overwhelming, and our first mistake was that we misinterpreted the response we got as a signal that they would buy. How good references one has from Europe are of no use. In the USA there is the syndrome which we can call 'not invented here,'" Heldre says.

Tandberg Data has problems with its prices in the USA, although an attempt is being made to find niches to rely on and find customers who are willing to pay for what is called the market's Rolls Royce. Hitherto there have been orders from, among others, the optics industry, universities, hospitals, the educational system, brokerage firms and banks.

Tandberg Data is not yet operating on a profit in the USA, but Heldre figures that this will occur next year. Moreover, it seems to take three to five years to enter the American market. Therefore, he is regarding the situation with optimism.

[Question] Have you also evaluated producing in low-cost countries?

[Answer] "I know that a group from Tandberg Data is in the process of investigating the possibilities, but what the conclusion will be it is impossible to say."

Tandberg has also established a division in Los Angeles which is to sell magnetic tape as a supplement for disk storages. Heldre believes it is important for Norwegian firms which are staking on the USA to have American subsidiary companies. Besides, it is important to have a good lawyer.

To save on a lawyer can become very expensive. It also takes more than small change to set up a private firm in the USA. Advertisements, for example, cost the same in dollars as in kroner at home. Besides, it is useful to have Americans included on the sales team, Heldre believes.

8985
CSO: 3698/265

COMPUTERS

SIEMENS INTRODUCES NEW MINICOMPUTERS TO COMPETE WITH IBM

Paris MINIS ET MICROS in French 28 Nov 83 p 35

[For related item, see JPRS-WST-84-002 of this series, dated 10 Jan 84 pp 16-17]

[Text] In response the new models of the 43 and 8100 series (discussed in a previous issue of MINIS ET MICROS), Siemens has introduced seven new computers. Three of these, in the 7550-X series, are in the class of top-of-the-line minis.

Siemens's 7570 series is being enhanced by new CPU's [central processing unit(s)]. Siemens has also announced four large systems in the 7570 series, "but that is another story." Almost at the same time, there has been a cascade of introductions of new minicomputers by the German manufacturer, whose introductions of new products, from Hanover Fair to Hanover Fair, have for some time now become customary. These include a new series, the 7800, which is a line of IBM-compatible computers comprised of eight models ranging in power from 2.7 to 27 MIPS [million instructions per second], competing at the lower end of the line with the large minicomputers Digital Equipment, Data General, Prime and Gould have accustomed us to, and at the top of the line with the large IBM, Univac, and other systems.

Characteristics of 7550 Series

More precisely speaking, this series includes Models B, D and N, in ascending order of power. The principal characteristics of these models are shown in the accompanying table. A few important important features are worth citing: Use of 128-Kbit MOS [metal-oxide semiconductor] chips in the main memory, a 1 M 8-bit-byte memory per I/O [input/output] processor, a screen with its own channel serving as console (color), the multiplexer with two channels per unit, the floating-address mode with an output rate of 3 M 8-bit-bytes per second, and the disk controller, which can be incorporated into the CPU bay.

Computing power ranges from 1.1 to 2.4 times that of the present 7541 model (0.8 to 1.8 MOPS [million operations per second]). Models B and D are each equipped with a self-triggering I/O processor; model N, being a dual proces-

sor, has two CPU's and one or two I/O processors, plus a maintenance processor. In case of a processing or input/output malfunction, it can be automatically reconfigured.

These machines are scheduled to become available during the second quarter of 1984 and, in the case of some, by the end of next year. They will be manufactured at Augsburg and at Munich.

Model 7550: Configurational Characteristics

Modèle	B	D	N
Mémoire centrale (M octets) (1)	2, 4, 6, 8, 12		4, 6, 8, 12, 16
Octet multiplex (2)	1		1
Attachements Bymux (3)	7 + (8)		7 + (8) + 15)
Bloc multiplex (4)	2 + (4)	3 + (4)	3 + (7)
Contrôleur de disques (3418) (5)	1/2 voie (6)	1/2 voie (6)	1/2 voie (6)
IVR (contrôleur terminaux, local et à distance) (7)	Oui (8)	Oui (8)	Oui (8)
Prix en FF (ht) (indicatifs au 1/10/83) (9)	1 318 000 (10) UC 2 M octets, contrôleur disque intégré, contrôleur terminaux, console couleur	1 747 000	2 470 000 (11) UC 4 M octets 6 canaux console couleur

Key:

1. Main memory (million 8-bit bytes).
2. Multiplex 8-bit byte.
3. Byte multiplex channel attachments.
4. Multiplexers.
5. Disk controller (3418).
6. One-half channel.
7. IVR [expansion unknown] (local and remote terminals controller).
8. Yes.
9. Price in French francs (exclusive of tax) (as of 1 October 1983).
10. CPU: 2 M 8-bit bytes; integrated disk controller; terminals controller; color console.
11. CPU: 4 M 8-bit bytes; 6 channels; color console.

9399
CSO: 3698/263

BRIEFS

NEW FRENCH SCIENTIFIC DATA BANK--Through their joint service entity BCT [Know-How and Techniques (Data) Bank], ANVAR [National Agency for the Implementation of Research] and CNRS [National Center for Scientific Research] are setting up a public data bank--LABINFO--of French scientific know-how and laboratory techniques, and of services being offered by them (research under contract, technical assistance, testing, documentary research, training, etc). At present, this data bank is comprised of 3,500 public and private laboratories and is accessible, beginning today, via the Telesystemes-Questel serving terminal. In due time, it will cover French research in its entirety. [Text] [Paris TOUTE L'ELECTRONIQUE in French Dec 83 p 8] 9399

CSO: 3698/263

FRENCH FIRM PLANS RECAPTURE OF DOMESTIC CAD/CAM MARKET

Paris ELECTRONIQUE ACTUALITES in French 13 Jan 84 p 3

[Article by D. L.]

[Text] Computerization of production engineering and the creation of data banks, together, form one of our top-priority axes of strategic effort," affirmed Mr Nollet, CEO [chief executive officer] of the CISI [International Data Processing Service Company], during a press conference held in December. And the firm unveiled a 5-year plan under which the CISI expects to attain, by the end of that period, an annual revenue of 650 MF [million francs] from its CAD/CAM [computer-aided design/computer-aided manufacturing] activities alone, as compared to the 57 MF it realized in this sector in 1983.

Under this plan, CISI has chosen to invest as an overriding priority in CAD/CAM of industrial products, and is bringing out a STRIM [Tridimensional System for the Mechanical Industry]-100 line of softwares for the mechanical industry. With this plan, CISI is making its bid as a candidate for the recapture of the domestic CAD/CAM market, a market that is currently being covered to the extent of 80 percent by foreign products, according to the experts.

CISI's decision to give priority to CAD/CAM as a developmental effort is based on the analysis made by the firm regarding the future of data processing. Whereas the activity of the data processing sector's industrial firms over the past 20 years has centered essentially on the manipulation of alphanumerical characters, CISI expects that, over the next 10 years, it will be centered on the operational handling of objects and of manufacturing plants; CISI emphasizes, moreover, that this second boom will be as substantial as the first.

CISI estimates the CAD/CAM world market will be between 26 GF [billion francs] and 42 GF in 1985, and will be growing at the rate of 35 to 40 percent annually by then. Of this total, the mechanical sector (industrial items) will represent 50 percent of the overall CAD/CAM market, with electronics accounting for 25 percent, and the rest being spread mainly over the cartography, engineering and chemical sectors.

Taken as a whole, the French market, estimated at 7 percent of the world market, represented a revenue of 400 MF in 1983, with Computervision's share of the French market estimated at close to 75 percent, followed by those of Applicon (Schlumberger), Calma and... IBM, which sells considerable hardware (particularly graphics consoles) and the Catia software designed by Lockheed and modified by Dassault. French industrial firms' (CISI, Datavision-Matra and Assygraph, which has been taken back again by Serete) share in this domestic market totals around 20 percent.

25 Percent of French Market

CISI considers itself well equipped to undertake the recapture of the domestic CSD/CAM market, citing its position as European leader (600 MF in 1983) in technical and industrial data processing (which spawned CAD/CAM), its marketing network, and its experience in graphics data processing, softwares, packages and networks. "We want to offer a complete spectrum of services and applications," Mr Nollet emphasized in this regard, adding that "The future of CAD lies in a greater integration of systems within the enterprise; hence the importance of local networks, which enhances the value of what we have to offer (with GIXI [expansion unknown]) over that of closed-loop CAD systems."

Thus, CISI has set for itself a CAD/CAM revenue goal of 650 MF in 1988, versus 57 MF in 1983, together with a staff increase over the same period from its present 70 persons to more than 500. The firm is planning to spend 80 MF on research and development over the next 3 years, and 150 MF in industrial investments, to attain its goal of 25 percent of the French CAD/CAM market.

This plan has been submitted to the DIELI [Directorate for the Electronics and Data Processing Industries]... from which CISI expects to obtain a subsidy. The firm is also an active participant (with Assygraph and Bull in particular) in the national CAD/CAM project--the first phase of which to have been launched is scheduled to be completed around mid-1984--on a product specification (amounting almost to a contract specification). CISI is hopeful that its "STRIM" will be chosen...

STRIM 100 is a portable software that makes it possible to evaluate, design and machine any industrial item. It consists of three modules developed by CISI jointly with AEROSPATIALE, Neyrpic, Weapons (ETCA [expansion unknown]) and INRIA [Institute for Research in Data Processing and Automation], and supported by IBM's 43 XX and 30 XX, Digital's VAX, and Bull's Mini-6, with Tektronix 4114/15 screens. Furthermore, STRIM 100 can be used on the "Cisinet" network and will be offered in conjunction with an Apollo-type microcomputer. This software package is completed by the Radiance 320 graphics terminal designed by GIXI. Some 50 STRIM 100's have already been sold, but CISI is already expanding its software production capacity at its Vitrolles CAD/CAM research and development center near Marseilles, and is preparing a compatible successor, STRIM 200, for the years 1985-1990.

9399
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FRENCH CONSULTING FIRM DEVELOPS OWN ROBOTICS

Paris INDUSTRIES ET TECHNIQUES in French 10 Oct 83 pp 23-26

[Article by Andre Larane: "Pont-a-Mousson Is Testing and Equipping Robots"]

> [Excerpts] Tool design, engineering and construction of work stations--here we have one of the leading robotics engineering companies.

At Pont-a-Mousson, near Nancy, the Saint Gobain Group has at its disposal an independent test unit which carries out robotization feasibility tests for its various subsidiaries. From foundry to household appliances, through packaging, insulation and glass, the areas concerned are very diverse. And the range is further increased by including outside firms in the areas of agricultural products, electric appliances, plumbing, etc.

It was at the end of 1979, after a visit to Mecca, that is, to Japan, that Jean-Jacques Girardin decided to create the Center for Robotics Skills. The head of Industrial Development of Pont-a-Mousson [Realisations industrielles de Pont-a-Mousson) continues to pay the same attention to "his baby" as he has since its birth in 1981. Although it consists of 11 persons (7 engineers and 4 technicians), the Center displays remarkable effectiveness. Nearly half of its turnover is realized outside the group. Some PMI's [Small, Medium Industries] bring it their robotization problems, either at the level of the work station, or, more often, in the design of grippers. The managers, Bernard Huber and Georges Bancon, vaunt several original devices, patented and being put to use.

The most promising is without a doubt the VAP (Versatile Automatic Prehensor), so named because it allows any articulated arm to change hands at will, and of course without human intervention. In a way we are dealing here with a wrist which is fixed to the end of the arm by means of a suitable plate. The gripping tools necessary for the work cycle are arranged on a rack. The wrist is fixed automatically on the required tool and transmits to it the fluids needed: electricity, water, compressed air, vacuum. Bernard Huber stresses the advantage of this device in assembly work. This is an area where it is necessary to have at one's disposal a range of tools adapted to various components.

Before designing a VAP for assembly work, the Skills Center built on the same principle a tool changer adapted to big parts. It is used in a machine plant of the group. Today, Pont-a-Mousson is carrying out life tests on the VAP. This is the last phase before placing it into operation. An American builder of robotized work stations, Automatix, is toying with the project of using it in its own systems. The Pont-a-Mousson technicians are interested in new materials. They have developed a gripping device made of fiberglass-reinforced material for handling rolls of insulating material. Thanks to a weight of 9 kilograms as against 22 kilograms for the previous system, made of Dural, the robot carries three rolls at a time instead of two. The hard work also produces a great improvement of productivity. Bernard Huber demonstrates a feasibility test carried out for a foundry of the group. A robot with a carrying capacity of 60 kilograms carries out in 20 seconds a deburring operation which required 90 seconds by a specialized worker. To automatize the work station it was necessary to revise the method of machining. Instead of the bakelite grinding wheel which the workers uses, the articulated arm uses an abrasive band. An additional advantage is that the part is not heated up. The intensity and direction of the force exerted by the part on the band are perfectly controlled by the robot's control box.

To cover the rolls of insulation with aluminum foil, the Center reconsidered the manual operation. It designed a mandrel held by an articulated arm on which the roll is fixed. The insulation is covered with adhesive and rolls on the aluminum foil without the usual to-and-fro movement with an operator. The automztization of the station with a standard robot presents tremendous advantages over a specialized machine; design time, price and amortization of the engineering are reduced. Moreover, the method can be applied to various roll models.

Technicians are after gripping devices capable of manipulating a group of parts. A gripper is being tested for manipulating foundry parts of various shapes; both cylindrical and parallelepipedic shapes are involved. This is a buoy-shaped air drain with granules inside. The air drain becomes rigid after being glued to the part, so as to assure precise positioning. The American Cincinnati [Milaron Co.] has just ordered from Pont-a-Mousson a tool capable of manipulating several engine valve plates. It will equip the robot installed in Angouleme, at Leroy-Somer's.

In the future, the definition of a robotized station will pass inevitably through the computer-assisted design stage. The team of J.-J. Girardin has a Computervision system with screen and minicomputer. It simulates operations so as to select an appropriate robot. It analyzes links with the rest of the line as well as the particular characteristics of the gripper if necessary. The same minicomputer serves off-line programming of the robots. It is known that a company specializing in logics, Dassault Systems, has just marketed a very carefully worked out model which performs all functions: graphic representation of the work station in action, simulation of all types of robots, design of particular devices and programming. We are done with hazardous and empirical automation. Firms will waste no time in finding engineering companies ready to analyze and

test their case with means beyond their own reach. The Robotics Skills Center is the forerunner of such companies. Its shop has nearly a dozen robots. All of them are leased by Pont-a-Mousson, just as the vision systems and the minicomputers are, to serve for feasibility tests. Customers are free to buy them if the tests are conclusive. To its research work, the Center adds the activity of training technicians and managers of the Saint Gobain group. Already, 700 persons have been introduced to robotics and the characteristics of the various articulated arms.

[Boxed insert: "Robotics Skills Center in a Nutshell"]

Under the Division of Industrial Development of Pont-a-Mousson, Inc., the Robotics Skills Center of the group has as its mission to inform and train potential users, to carry out feasibility tests, to develop equipment and to give technical assistance. A dozen feasibility tests are in progress at all times in its shop (robot and aritifical vision). Its annual services have reached the figure of 7 million francs, half of this outside the group. This corresponds to an overall turnover (complete robotized stations) on the order of 70 million.

5586
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ITALY INVENTS ROBOT TO COMPETE WITH ASEA, HITACHI

Milan MONDO ECONOMICO in Italian 3 Nov 83 pp 68, 69

[Article by Carlo Arcari: "With the Top Robot"]

[Text] For 2 years they have been working together to develop robots in the textile sector, a field that automation had always had difficulty in penetrating. Today, as a result of a number of front-rank developments (including Robbin, a pair of robots that handle a continuous synthetic spinning system in the Anic plant in Pisticci), Savio, a company of the ENI group that operates in the mechanical-textile sector, and the Primo group, which specializes in application of industrial robots in the automobile sector, have established a new corporation. It is called Sapri and aims primarily at spreading the "automatic factory" within the textile industry.

Luigi Mezzetti, Savio vice president and in charge of the robot sector in the company, said that "Robots in spinning will help to achieve a cycle that will be continuous and programmable yet still involve manual labor, in particular in the interface among machines, in handling and organizing the cones, and in loading the looms."

"This is a decision," he continued, "that is forced on the industrialized countries if they do not want to succumb to the competition of the textile firms of the Third World, where the cost of labor is only one-tenth as high."

Sapri will draw on the extensive knowhow of the two composing companies and will not limit its efforts to the textile sector, but will also try to assert itself in areas not thus far affected by robot technology. The company's stock of products is impressive. In addition to Earnest-One, the articulated robot that cost Savio 2 years of research, there are Jack-One, a low-cost simple manipulator; Star, a handling robot that can operate along a structure up to 20 meters long; and Speedy, a rapid handler of small-dimension objects.

Mezzetti noted that "Earnest, which can handle simultaneously up to six cones in spinning, is already in use successfully in numerous applications outside the textile industry, in production islands, for example, and in continuous thread welding, which is Italy's unique achievement in competition with Asea, Hitachi and Clos."

Another application in which the Savio robot is developing an interesting market is in adhesive and sealant operations. The little Speedy, on the other hand, specializes in filling boxes of Perugina chocolate. In confirmation of

Savio's entrance into the robot sector, there are also the close ties of cooperation that the company has recently developed with certain Italian universities that have had active research units for a number of years. An Earnest-One has been purchased by the Torino Polytechnic and another has been leased to the University of Bologna, while negotiations are underway also with the University of Pisa.

In Bologna and Torino research is underway on autoadaptive grasping organs, that is, mechanical hands capable of manipulating different objects, from bolts to fruit. On the other hand, in Pisa efforts are being concentrated on developing special touch sensors for robots. The Earnest-One robots have doubled outright the number of industrial robots currently devoted to research activity in Italian education, which had previously obtained two Puma robots from the U.S. Unimation company. Savio representatives say: "The machines were provided to the universities on favorable terms. In exchange, we expect that research topics pursued by the universities will be jointly developed."

9920
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FACTORY AUTOMATION

SGS AUTOMATES TRANSISTOR PACKAGING IN ITALY

Paris INDUSTRIES ET TECHNIQUES in French 10 Dec 83 p 29

[Article by F. B.]

[Text] Among its discrete-semiconductor-related activities, SGS [General Semiconductor Company] produces, in Catania, Sicily, a line of power transistors--its TO 3 line--packaged in metallic cases. In Catania, the watchword is productivity. All labor-intensive operations have been transferred to Singapore, leaving nothing in Sicily but high-technology operations. This explains the fact that the packaging of transistors is now fully automated.

The automated production line consists of three sections that perform all the operations from the placing of the chip on its substrate to the testing and marking of the packages by laser and their boxing up. It has a maximum capacity of 30,000 pieces/hour and will employ not more than 6 persons for production, which will begin at the rate of 500 packages/hour.

The first section places the chip on its substrate. The integrated circuits are lifted off the wafer by suction and placed on the metallic base. A pattern recognition system identifies the good chips. The faulty ones have previously been marked by laser. The substrates are then placed in a carriage having 155 x 25 (= 3,875) places. When the carriage has been filled, it is conveyed to the bonding machine which automatically solders two pigtails on to the few square millimeters of surface of each chip. This machine is also equipped with a pattern recognition system that identifies the position of the chip, to ensure exactment placement of the pigtails.

At this time, a first quality check is made; a manipulator will then unload the substrates from their carriage to stack them, in groups of 15, in cassettes, which will be the means of handling them throughout the automated packaging line. This line begins after the chips have undergone a heat treatment. A belt-type conveyor, spanning a distance of almost 30 meters, will convey these cassettes through the different packaging operations involved: Closing and soldering in a nitrogen atmosphere, then lead tinning, followed by cleanup using liquid and gaseous freon, inking of the cover (black ink which is then silvered) and drying. A buffer stack is created at each stage in the process to ensure a steady flow of packages along this mini-assembly-line.

For the time being, the final operation, namely, testing, requires transferring the piece outside the line, but SGS says that very shortly this last stage will be incorporated into the automated line. The components are tested by means of a Teradyne automatic tester. As soon as a part tests "Good," its characteristics and its reference number are inscribed by laser on the cover of its package. This tandem coupling of the testing and marking operations represents a considerable advantage for SGS's electronic components: It is their exact characteristics, resulting from the tests, that are inscribed on the components, and not their theoretical characteristics. Lastly, after marking, the packages are deposited directly on to the supporting base in which they will finally be boxed up.

The design of this production line is SGS's own; its installation, except for the first machines (Orthodyne) that do the placement and bonding, done by the Swiss firm Montech.

9399
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MICROELECTRONICS

FIRST THOMSON GALLIUM ARSENIDE STANDARD CELL

Paris ELECTRONIQUE ACTUALITES in French 3 Feb 84 p 16

[Article by JPDM]

[Text] Following last April's reorganization of the hybrid activities in Thomson-CSF's microwave components division (DCM) at Massy (see ELECTRONIQUE ACTUALITES of 23 September 1983), that division organized a press conference at the end of January, partly to show that it has become a full-fledged manufacturer in this area, and partly to announce that custom GaAs integrated circuits will be available on the free market beginning in 1985, with the first samples being forthcoming at that time as well.

This conference occurs two months after Plessey's announcement of an investment of 20 million pounds over a three-year period in this same field (Thomson-CSF said nothing of its own future investments in GaAs).

The memorable facts from this press conference are the division's sales growth (50 MF in 1979; 110 MF in 1980; 130 MF in 1981; 160 MF in 1982; 348 MF in 1983; and +30 percent forecast for 1984), and the magnitude of the facilities already installed for the industrial development of GaAs circuits.

Library of 50 GaAs Circuits

We might remember that DCM is organized in three departments, at different locations:

III-V Semiconductor Components (DAG), at Corbeville, with 1983 revenue of 114 MF with 82 percent research;

Ultrahigh Frequency Electronics (DMH), at Massy-Palaiseau, whose 1983 revenue reached 100 MF with 25 percent research;

Silicon and Gyromagnetism (DSG), at Montreuil, whose 1983 revenue was 134 MF with 11 percent research.

While the last two departments have reached an industrial stage, with current investments (66 MF in 1983 for all three departments) being aimed at improved productivity, the goal of the first one is still to achieve industrial production. But the goal appears to be near.

We might also remember that GaAs integrated circuits have four potential markets:

Analog microwave circuits for professional applications;

Very fast logic signal processing circuits for civilian and military applications;

Analog circuits for 12 GHz public satellite reception heads;

LSI logic circuits designed to replace various current ECL computer circuits.

For the time being, DCM is aiming only at the first two possibilities, essentially for strategic reasons as part of the Thomson-CSF systems activities. DCM enjoys a favorable environment with LCR (Central Research Laboratory), as well as autonomous design, fabrication, and test facilities; it has an installed production capacity of 50 2.5-inch wafers per month. Assuming that 5000 (small) circuits can be integrated per wafer, and that the yield is of the order of 10 percent, this capability corresponds to 25,000 circuits per month, a figure which is no longer within the laboratory domain.

The market sectors are already, or almost, defined. In digital circuits, a BFL/1 micron type of technology is selected for its speed and low output impedance, which allows ECL compatibility. Propagation time is of the order of 100 ps at 300 ps/gate depending on the selected configuration, with consumption varying between 1 and 7 mW/gate. Unfortunately, this technology requires three supply voltages, and does not allow high levels of integration (up to 500 gates/chip).

The analog market sector, also with a 1 micron technology, allows the fabrication of integrated circuits operating beyond 10 GHz.

In collaboration with six customers (on an Applicon system), DAG is currently completing the formulation of a 50-cell library (without counting buffer variants) for GaAs standard cells.

Samples of the first standard cell GaAs circuits for Thomson-CSF's needs should be available within three months, with service for outside customers being planned for 1985. A 500-gate array with two-level interconnections on 10 square-mm is currently being perfected. For these two types of semi-standard circuits, the future fabrication delay should be of the order of two months, as in the case of silicon integrated circuits. In principle, customers will have to design their own circuits with the library provided to them. A large scale integration (LSI) market sector could be implemented in the future if the market warranted it (first samples for 1987?).

11 Percent for Exportation

DCM, which obtains 41.4 percent of its product revenue from hybrid circuits, 33.6 percent from gyromagnetism, 21 percent from UHF diodes, and 4 percent from various components (optics, FET, and so on), presently exports 11 percent of its production and devotes 70 percent of it to the needs of the Thomson-CSF group. Its production of UHF hybrid circuits is currently almost fully devoted to the group (this being a matter of circumstances rather than intent), but DCM could cover 7 percent of the world market for UHF diodes and 7 percent of the world market for gyromagnetic components. (In the first area, the world leaders are Alpha Industries with 30 percent, and M/A COM with 25 percent; in the second, the leaders are M/A COM with 28 percent and Raytheon with 10 percent).

Actually, DCM believes that its components are among the best in the world in high power ferrite devices, in its silicon diodes as a whole (94 GHz avalanche diodes are under development), and in all its GaAs diodes (currently under study are 50 mW/94 GHz InP Gunn diodes, 94 GHz beam-lead Schottky diodes, and an Impatt diode of several average watts in the J-band).

In the FET area, DCM is presently developing 1 W FET's of 4-12 GHz, or 2 dB of noise at 12 GHz. Also being studied are 3 W devices of up to 8 GHz, and a very fast TEGFET structure.

11,023
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FRENCH FIRM TO DO MICROPROCESSOR, SOFTWARE RESEARCH

Paris TOUTE L'ELECTRONIQUE in French Dec 83 p 12

[Text] RTC [Radio Technology-Compelec] has announced the creation of a new internationally-oriented entity to specialize in the design of IC's [integrated circuit(s)] and the development of microelectronics software. It will confine its work principally to the field of MOS's [metal-oxide semiconductor(s)].

The new firm, to be known as CIMA RTC-Fontenay [International Center for Applied Microelectronics, RTC (at) Fontenay] will be installed in the region of Paris, at Fontenay-aux-Roses.

CIMA RTC-Fontenay will develop microprocessors, peripheral circuits, cards and associated software.

It will also provide assistance in the application and use of its microprocessors and software, and train engineers specializing in these disciplines.

CIMA RTC-Fortenay's role will be to make available its support and know-how to the European firms of the Philips-Elcoma Electronic Components Organization, such as Valvo in Germany, Mullard in Great Britain, and Philips in Italy and the Netherlands, enabling them to provide, on their own, the best possible services to their respective clients in these domains.

In France, the results of the work of CIMA RTC-Fontenay will be made available to the French equipment builders through the Microelectronics Division of RTC Ledru-Rollin.

9399
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JAPANESE FIRM (EPSON) SETS UP SUBSIDIARY IN FRANCE

Paris TOUTE L'ELECTRONIQUE in French Dec 83 p 12

[Text] Pursuant to French Government approval given to Mr Tsuneya Nakamura, president of Epson Corporation Japan, this firm has announced the setting up of a new subsidiary in France: Epson France S.A.

Epson is one of the principal firms of the Seiko group.

France represents for Epson its third largest market in Europe and the one with probably the greatest potential for growth over the next decade.

In accordance with the agreement signed between Epson Corporation and the French Government, Epson France S.A. will install a plant in France to produce matrix printers of the RX and FX series and future generations of these products. The value-added segment to be realized in France by this plant is projected to attain 50 percent in 3 years, based on maximum utilization of locally available materials and services.

The exact location of this plant has not yet been decided. It is to be decided around spring of 1984. By the end of 1984, it should be producing between 2,000 and 3,000 units, attaining a level of 5,000 units in 1985.

Epson France S.A. will handle the company's commercial activities in Southern Europe (France, Italy, Spain and Portugal) as well as those in French-speaking Africa. Marketing, sales, distribution, technical support and customer relations will all come under Epson France S.A. throughout the aforementioned territory. Together with the territory being covered at present by Epson UK Ltd and Epson Deutschland GMBH, the Epson Corporation's other two European subsidiaries, this now puts the corporation in a position to be able to cover effectively the markets of all of Europe, the Middle East and Africa.

Technology Ressources S.A. will remain the sole distributor in France for the firm's microcomputer and printer products, handling sales to all OEM [original equipment manufacturer] clients and to the network of sales outlets that presently covers 170 sales points.

Tekelec Airtronic S.A. is the distributor for micro-printer mechanisms and liquid crystal displays manufactured originally for the OEM market.

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BRIEFS

THOMSON REORGANIZES FRG SUBSIDIARIES--Thomson has just created in FRG a holding company which will control its West German consumer products subsidiaries, Dual, Nordmende, Telefunken, Thomson, Elektronik, and Saba. The new enterprise will be based in Villingen, where Saba is already headquartered. We might point out that Thomson's consumer products branch provides one-third of its total FRG revenue. [Text] [Paris ELECTRONIQUE ACTUALITES in French 3 Feb 84 p 2] 11,023

CSO: 3698/267

SCIENTIFIC AND INDUSTRIAL POLICY

FABIUS ON FRANCE'S RESEARCH FUNDING GOAL, NEW R&D MEASURES

Paris LE MONDE in French 11 Feb 84 p 22

[Interview with Laurent Fabius, minister of industry and research, by Maurice Arvonny, Jean-Francois Augereau and Elisabeth Gordon, date and place not specified. For related information see JPRS WEST EUROPE REPORT, SCIENCE AND TECHNOLOGY No. 163(JPRS 84722) and WST-84-005]

[Text] In an interview with LE MONDE, Laurent Fabius, minister of industry and research, admitted that the ambitious goal of May 1981--2.5 percent of the GDP for research--will not be reached before 1986. He announced various measures designed to favor research in industry and has appealed for a renewal of European science.

[Question] Your predecessors at this ministry were much more concerned with industry than research. Don't you feel you have followed the same path?

[Answer] That was not true of my immediate predecessor. And this is not true of me either because I give absolute priority to research. We must correct the error of separating, or even opposing, research and industry, as if the one was for the long term and the other for the short term. In fact, if you are working for research you are also working for industry. I don't believe that I divide my time between one and the other but that I help each progress with the assistance of the other.

On the concrete level, I have on my desk for the upcoming weeks several important documents on research policy, in particular the implementation of improved status for staff in research institutes by adapting the general decree issued at the end of 1983; the preparation of the 1985 budget; development of industrial research; definition of the long-term aerospace policy; follow-up on the regional activity in the area of research; the role of scientific and technical associations and contacts with my European colleagues to encourage scientific cooperation within the EEC. As you can see, interest in research is both diversified and vital.

[Question] What has been the actual amount spent on research the past few years? Amounts that, because of adjustments, differ from the amounts voted by Parliament. Has there really been an increase in appropriations for research?

[Answer] If you add ordinary appropriations and program authorizations--to use budgetary language--the figures are the following: in the original appropriation bills, credits were 19.7 billion francs in 1981, 26.1 billion in 1982, 32.5 billion in 1983 and 37.6 billion in 1984. If we now look at the budget as it was implemented, the corresponding figures are slightly lower: 24.6 billion in 1982 and 30.4 billion in 1983 because of the "budgetary readjustment." The increase, even if it is less than what we might want, is definitely there: +24.8 percent between 1981 and 1982, +23.7 percent between 1982 and 1983. The "readjustment" was felt rather severely by the scientific community, especially in the way it was implemented. Despite this, we must honestly recognize that the priority given to research has been maintained.

To take another reference point, this time in relation to the gross domestic product, in 1978 we reached the lowest point in the national research effort; it was then 1.76 percent of the GDP. In 1983 we climbed up to 2.15 percent and, according to the estimates of experts, in 1984 we should reach 2.20 percent of the GDP. We are going to surpass the largest research effort ever made in France, which occurred at the time of General de Gaulle in 1967 when expenditures for research were 2.16 percent of the GDP.

[Question] This means that the 2.5 percent of the GDP that was planned for research in 1985 will not be reached.

[Answer] For 1985 I am afraid not. The orientation and planning law for research indicated that meeting this goal would be dependent on large-scale economic trends. I do hope that this figure can be reached in 1986 or 1987. However, aside from this indicator, remember what the trend of the last 3 years means and the undeniable priority given to research in the country's policy.

"Maintain Our Basic Options"

[Question] How can we reach this figure of 2.5 percent when the ministry of finance is talking about zero growth for 1985? Will that apply to research?

[Answer] As soon as you want to decrease obligatory withholdings--which is an excellent idea--you have to reduce expenditures. We will therefore be in a climate of austerity. But within this climate we must maintain our basic options: research, industry and training. It is indispensable that both basic and applied research, which is the key to the future, maintain its priority.

[Question] You recently reported to the council of ministers on enhancing the research of the CNRS [National Center for Scientific Research]. Do you think that researchers are ready to collaborate with businessmen and that businessmen are ready to ask researchers their opinion, especially about the seriousness of the "miracle" methods?

[Answer] One word on the last part of your question. To claim--as some did in reference to the matter you mentioned--that within the French scientific community there are no specialists able to acquire a skill and to keep it secret is preposterous!

On a more general level as regards ordinary cooperation between research and industry, I have noted that on the whole things have changed for the better. Recall the attitude and practices that were still in force a few years ago--too often there was a sort of mutual distrust. One of the most fruitful results of the regional meetings and of the national colloquium "Research and Technology," as well as of the orientation and planning law, was to instill ties of confidence and to begin to break down the barriers. As examples of this, cooperation has begun, skeleton agreements have been drawn up and public interest groups have formed between large research institutes and businesses.

Similarly, active cooperation has been initiated between CNRS and Saint-Gobain, EDF [Electricity of France], Roussel-UCLAF, Renault and many others. Cooperation will be facilitated by the measures taken to improve the mobility of personnel. On the researcher's side there is a desire to work with firms and the means for doing so are available. I will add that the assessment of the researcher's career will be based mostly on this mobility and on actions taken to enhance this field.

As for businesses, they will know that research is the key to the future. Dynamic firms are usually those that devote the most effort to research and that are the most open to researchers. The primary advantage of a country like ours lies in this resource of intelligence. With this in mind we are going to take measures to encourage industrial research. The function of research director must be fully recognized in industry and be put in the forefront in firms and their administrative offices. I will also try to increase the number of scientists on the boards of directors of national firms.

There is work still to be done but things are moving in the right direction. In this area as in others we must keep in mind the basic importance of the role of the university in all research since it adds to research the aspect of training, which is essential for industrial development.

The Research Tax Credit

[Question] What you have been saying applies mostly to large business. But shouldn't scientists be encouraged to be part of small businesses?

[Answer] Certainly. Of course, researchers are sometimes more attracted by large firms. Movement to small businesses is often illustrated by the researcher who starts his own firm, which, by the way, is an excellent thing which should be encouraged. The most important measure taken recently in favor of small businesses is the research tax credit which is having a real effect on small businesses. There are also technological consultants in the regions and regional delegates for research and technology who are responsible, in particular, for encouraging the transfer of technology and skills to small businesses. All of this must be developed.

[Question] What measures do you plan to take to stimulate industrial research?

[Answer] Responsibility for developing industrial research lies first with firms, but the state can and should help. The Higher Council for Research and Technology recently completed a remarkable work of analysis and suggestions on this subject. On that basis I decided to double the number of industrial training contracts for research (CIFRE scholarships) in 1984. Priority will be granted to small businesses for these contracts. In addition, appropriations from the Fund for Research and Technology for industrial research will also be doubled in 1984. This is 50 percent of the Fund, over 600 million francs.

Small businesses can greatly benefit here, too. The number of engineers trained in the mining schools, which fall under my ministry, should increase significantly between now and 1988. Emphasis will be placed on teaching advanced technologies and we are refining a system for the students in these schools to develop industrial projects and to encourage new businesses. We are also working with the minister of national education to pool our resources to develop the teaching and practice of research in all of the engineering schools. There are several concrete measures that favor industrial research.

[Question] In a few weeks you will chair the meeting of the EEC ministers of research. What do you intend to suggest to your European colleagues?

[Answer] This meeting will take place on 28 February. The first matter of importance is to get the Esprit program adopted. This is the first concrete European program devoted to electronics and information technology and which involves European research and industries. Some countries are still hesitant. We are working to remove these hesitations.

A second area that is very important is that of biotechnologies; the Brussels Commission is preparing some proposals about this. I myself recently shared my thoughts with the Commission and I hope that this topic will be broached by the ministers of research during the first half of the year. Development of biotechnologies can help resolve two major problems in the future: absorbing agricultural deficits, particularly soybeans, and using agricultural surpluses by transforming them into industrial materials.

A third theme is the exchange of researchers, which is currently quite inadequate in Europe. I hope that two initiatives can be taken, one at the level of the European Community to stimulate the exchange of researchers and the other at the Council of Europe when we have suggested a meeting of the 21 ministers of research. This meeting could be held during the second half of the year in France; the topic would be the mobility of researchers, and it is hoped that concrete measures would result.

Generally speaking, I have noted a threefold trend in the area of research at this time. On the one hand, the scientific community feels the need, and has expressed it more and more, to open up and diffuse its knowledge. On the other hand, our national communities are showing more and more interest in scientific and technical questions, for which they have assessed the economic, social and moral stakes. There is an extraordinary interest in research, for this passion

called research, especially by young people. The purely national dimension, compared to the United States or Japan, is often felt to be inadequate and there is a great need for Europe. This threefold trend, which affects the so-called hard sciences as well as social and human sciences, is an historic opportunity for the development of research. France and Europe must absolutely seize this chance.

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EARNINGS, ACTIVITIES OF FRANCE'S SEP REVIEWED FOR 1983

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[Text] Pierre Soufflet, chief executive officer of SEP (European Propellant Company) stated on 26 January that 1983 "was not particularly notable" for the firm, which had a turnover that increased 14.4 percent (5 percent in constant francs) but profits that declined.

The firm's activity has been "good"--1.38 billion francs in turnover compared to 1.206 in 1982--and estimates for 1984 orders are over 2 billion francs (of which 1.43 billion are already on the books), which is greater than SEP's capacities. Soufflet stated, however, that net figures have been mediocre; the balance remained positive but went from 17 million francs in 1982 to 5 million francs.

The firm's turnover was divided as follows: 33 percent for the "liquid propellants and aerospace division" which makes the Ariane engines, 60.5 percent for the "explosives and multi-stage missile division" and 6.5 percent for the "image processing division."

Prospects are quite promising for this last sector of SEP's activity, which constructs earth stations for receiving and processing images from remote sensing satellites. Two large contracts have been signed (with Sweden and France) even though no such satellites are currently in orbit. The successor to Landsat D (American), which broke down last February, will not be launched until next March and the French Spot satellite is scheduled to be launched at the end of 1985.

Prospects are not as good in the medium-term for the explosives and multi-stage missile division, despite the success of SEP's products in this area. The Hades program (the tactical nuclear missile that succeeded Pluton), despite its importance at the national level, accounts for only 10 percent of the turnover of the division, according to Soufflet, and if a decision is not made by the government in 1986 to initiate the SX program (strategic mobile ballistic missile), he believes that this division's position will be "extremely critical."

It will be necessary for this division to find new outlets in the area of composite materials, where it has already had great success. SEP equips the Mirage 2000 and Formula 1 cars of Ferrarri, McLaren and Renault with carbon disk brakes, which have also been installed for tests on an Airbus. SEP is also studying using ceramic parts in the hot portions of engines (diesels and turboprops).

In the aerospace area Soufflet hopes that Ariane can be tested 4 times in 1984 and possible 6 in 1985. SEP is currently conducting bench tests of engines for the Ariane 3 version, for which the first launch is scheduled for this year. "CNES [National Center for Space Studies] wants the first flight of Ariane-4 to be in March 1986. This delay seems untenable to us," stated Soufflet.

SEP's chief executive officer also hoped that a decision would be taken by the government this year to start development of the large cryogenic HM-60 engine that is to equip the new generation launchers. "If they do, we will be busy for 10 years," he stated. "If they do not, the development section of our 'liquid propellant and aerospace' division will collapse."

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